

Coastal Waters Imaging: Instrument and Data Utility Issues

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SAMSON in aircraft with stabilized mount



SAMSON performance:

- Airborne hyperspectral instrument covering 0.4 – 0.9 micron wavelength range with 3 nanometer spectral resolution.
- Images a frame of 1024 x 512 pixels at 150 frames/second.
- Integrated with Inertial Navigation System to allow geospatial corrections accurate to within a centimeter.



SAMSON flight lines over the coast near Santa Barbara, CA

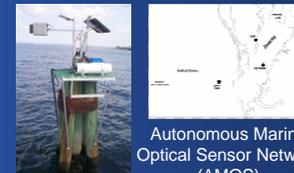
NGST has collaborated with the Florida Environmental Research Institute (FERI) which specializes in coastal imaging including hyperspectral data collection, analysis and distribution

* Kohler, D. D. R., et al., "Hyperspectral Remote Sensing of the Coastal Environment", Proceeding of Ocean Optics XVIII, Montreal, Quebec (2006)

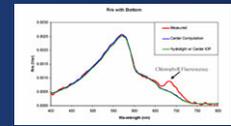
A complete set of apparent and inherent optical measurements of the water surface, in-situ depth profiles and vessel path transects were taken along with biological and chemical samples at various anchorages off the Florida Keys.



The slow drop package
Close-up view of instrumentation: ac-9



Autonomous Marine Optical Sensor Network (AMOS)



Measured and simulated Rrs with bottom effects: AMOS Simulation #1

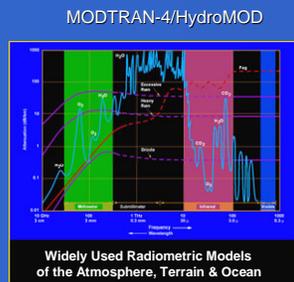
Data from Dr. K. Carder's group (University of South Florida) was used to carry out Hydrolight closure experiments. In this study, the Hydrolight modeling and simulation tool was used to generate synthetic data which was compared to actual measurements of coastal areas in Tampa Bay, Florida

Key areas of NGST coastal waters research

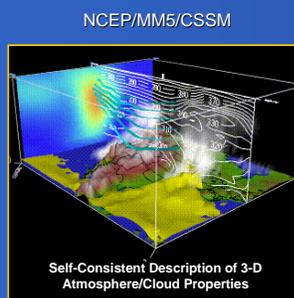
- A team which includes national experts in ocean color imaging
- Matlab-based vicarious calibration process and participation in field calibration experiments
- Demonstration of Hydrolight simulation closure in complex near-shore waters
- Analysis tools
- Scene simulation
- Validated end-to-end coastal modeling and analysis

End-to-End Scene Simulation Combines

- Self-consistent treatment of 3-D atmosphere, weather & terrain properties
- High resolution terrain factors databases & spectral reflectance libraries
- Validated radiative transfer models for the atmosphere, terrain & ocean, including HydroMod – a new coupled ocean-atmosphere RTM capability
- Generic sensor & spacecraft models



Widely Used Radiometric Models of the Atmosphere, Terrain & Ocean



Self-Consistent Description of 3-D Atmosphere/Cloud Properties



SRTM/NLCD/MODIS QST



High Resolution Terrain Factors Databases & Reflectance Spectra

Current scene generation and analysis exercise uses FERI SAMSON data over Santa Barbara to:

- Demonstrate optical closure in near-shore coastal waters, using in-situ bio-optical data in HydroMod to compare predicted Rrs with independent measurements
- Carry out chlorophyll a retrievals using MODIS and SeaWiFS OC4v4 algorithms
- Serve as the basis for simulated scenes - chlorophyll retrievals are used with HydroMod to generate radiance at TOA. Simulated scenes can then be used to test analysis algorithms and their sensitivity to various sensor parameters.